Response of *Pseudomyrmex spinicola* to *Icterus pustulatus* nest materials and position

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Abstract: The streaked-backed oriole, *Icterus pustulatus*, constructs its hanging nests on the branches of the ant-acacia tree, *Acacia collinsii*. *A. collinsii* is inhabited by an ant species, *Pseudomyrmex spinicola*, which aggressively defends its host. We hypothesized that the materials used in the nests of the streaked-backed oriole act as a deterrent to the defense-response of *P. spinicola*. We tested this hypothesis by comparing the defense-response of ants to oriole nest materials and control nest materials in proximal and distal locations of *A. collinsii*. Results indicated lower ant aggression in proximal branches compared to positions nearer the bole. However, we found no evidence that materials used by the streaked-backed oriole deter ant response. It appears that the streaked-backed oriole relies on distal nest placement to shield its nest from *P. spinicola*, while at the same time relying on the ant as an effective defense against nest predation.

Key Words: Acacia collinsii, *ant defense, bird nest placement, streaked-backed oriole*

Introduction

Icterus pustulatus, the streaked-backed oriole, often constructs its hanging nests on the branch tips of *Acacia collinsii* trees (Stiles and Skutch 1989), which are inhabited by mutualistic ants. Another bird species that nests in *A. collinsii* trees, the rufous-naped wren (*Campylorhynchus rufinucha*), prefers nesting in trees with the most aggressive colonies of ants, particularly those of *P.seudomyrmex spinicola* and *P. nigrocinctus*. Although the streaked-backed oriole might also prefer trees with more aggressive ant species, they are inhibited from nesting there by the wrens (Young et al. 1990). These observations suggest that streaked-backed orioles nesting in ant-acacia trees favor the increased nest protection provided by the ants despite the potential costs of physical harm to themselves or their offspring.

Janzen (1983) argued that the streaked-backed oriole is able to nest in *A. collinsii* because the ants grow accustomed to the birds' nests; however, the specific mechanism for such a response is not known. We hypothesized that the nest material used by the oriole and the location of the nests within the tree may affect ant response. A major component of streaked-backed oriole nests not frequently found in other oriole nests is a black fungal rhizomorph (Stiles and Skutch 1989), and it has been suggested that the rhizomorph may inhibit ant defense-response (Gonzalez, pers. comm.). We therefore tested the prediction that materials used in the oriole nests act as an ant deterrent. We also tested the prediction that ant defense-response to nests would be stronger on nests placed near the trunk of the tree (proximal positions) as compared with those suspended from distal branch positions. This prediction was based on our observations that the bole of the tree has a higher number of patrolling ants than the outer branches.

Methods

This study was conducted in a tropical dry forest 0.5 km NE of the Palo Verde OTS field station, Costa Rica, on 13 - 14 January 2000. We haphazardly selected 16 *A. collinsii* trees inhabited by *P. spinicola* colonies, and randomly determined the position and treatment of our artificial nests. There were two positions: at the intersection of a branch and the bole (proximal nests), and on the outer

sections within 20 cm of the branch tip (distal nests); and two treatments: oriole nest and control nest.

Material used for nests involved fibers from an abandoned streaked-backed oriole nest for our experimental nests and grasses near each *A. collinsii* tree for control nests. Nests were 16 cm long and 3 cm wide, and were folded in half around the tree in the two specified positions. We wore latex gloves while handling all nests to prevent chemical interference from human scent. Branches were standardized for ant populations by limiting the branches to a range of 10 – 15 thorns and excluding those with Beltian bodies, which might affect ant defense-response (Ungerer et al. 1998).

After attaching an artificial nest to a tree, we imposed 30 s of mechanical disturbance, in which a pencil was tapped against the nest, followed by five counts of ant numbers at 1 min intervals and then five more counts at subsequent 5 min intervals. At each time, we recorded the number of ants on or within 2 cm of the nest. This sequence of measurements was repeated consecutively for three 30 min intervals for each nesting material in each branch position. We used each of our 16 trees once, with four replicates of each possible combination of nest material (oriole or control) and nest position (proximal or distal).

To test for acclimatization of ants to oriole nest materials, we compared the differences in ant defense-response between each time interval. We expressed ant defense-response as the maximum minus the minimum number of ants during each 30 min measuring period. Data were log-transformed to correct for heteroscedasticity. We used an ANOVA to test for effects on ant response of nest material (oriole nest vs. natural vegetation), position within tree (proximal vs. distal), time (3 measurement bouts), and all possible interactions.

Results

Maximum difference in ant number was almost 6-fold higher on experimental nests in the proximal position than in the distal position (Fig. 1; $F_{1,44} = 83.21$, $p < 0.0001$). Ant density decreased over time in the distal position, but not in the proximal position (time x position interaction: $F_{2,44} = 5.31$, $p = 0.01$). There was no effect of nest material ($F_{1,44} = 1.05$, $p = 0.33$) and no significant interaction involving nest material ($p > 0.27$).

Discussion

Our results falsified the prediction that *P. spinicola* aggression was mitigated by nesting material of the streaked-backed oriole, but supported the prediction that distal nests evoke less ant response than proximal nests. Apparently, ant aggression cannot explain why streaked-backed orioles build their nests out of the black fungal rhizomorph. Additionally, we found that the ant defense-response over time decreased in the distal position, but not in the proximal position. The decrease in ant response over time to nests in distal branches may explain why streaked-backed orioles place their nests on more distal portions of *A. collinsii* branches (Stiles and Skutch 1989). In this position, the ants will inhibit predators from climbing up to the nests but will not necessarily attack the nests. Although not supported by our results, it is possible that studies with longer periods of observation would indicate that nest material also contributes to minimizing ant aggression against nests.

Among bird species, predation on eggs and nestlings is a major source of mortality (Ricklefs 19??). Thus, natural selection should favor any behaviors that reduce mortality risks of eggs and nestlings. The aggressive defense-response of *P. spinicola* to disturbances on *A. collinsii* trees may be an effective adap-

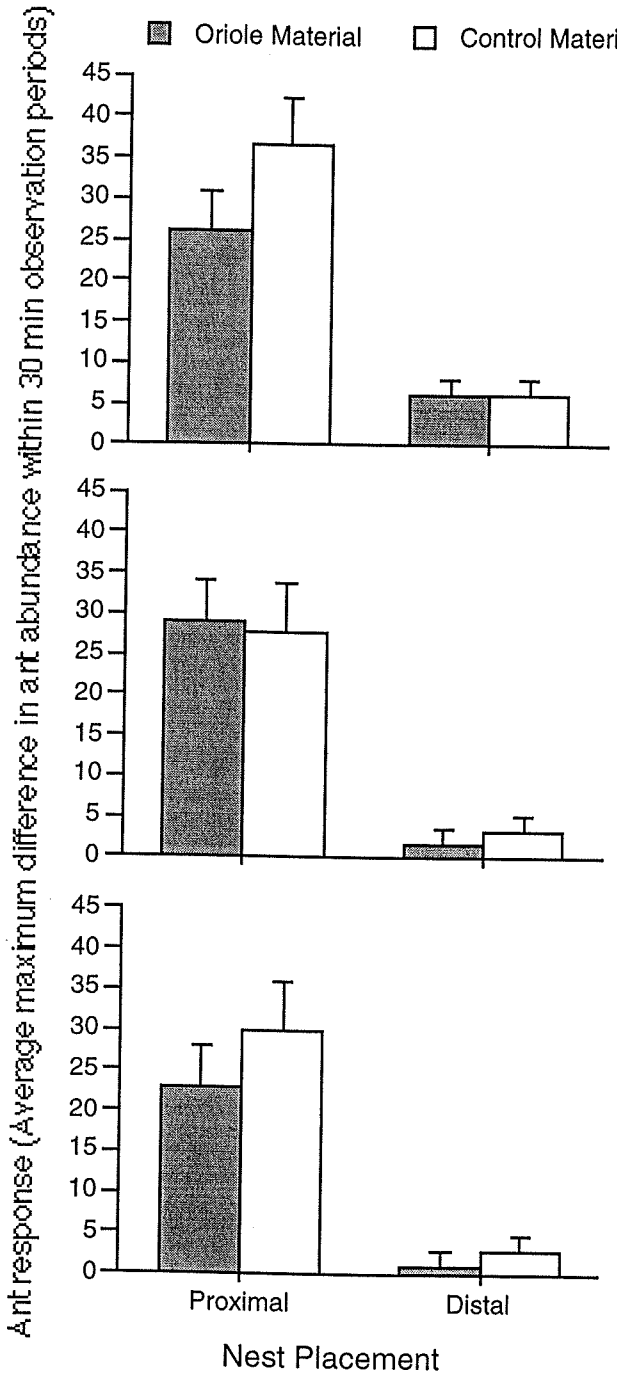

Fig. 1. Mean maximal difference (± SE) of ant defense-response to oriole and control nest materials in both proximal and distal positions over three consecutive 30 min time intervals (n = 4 trees). Time intervals 1, 2, and 3 are shown from top to bottom.

tation against nest predators for those bird species that can shield their nests from the ants. The streaked-backed oriole apparently protects its nests from ants by placing them in a distal position near the branch-tips of trees, where ant aggression is minimized.

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